



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/741,307  
Applicant : J. Ahmad  
Filed : December 19, 2003  
Title : Protective Structure and Protective System

TC/A.U. : 3644  
Examiner : Jordan M. Lofdahl

Docket No. : 104990.143786

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: P.O. Box 1450, Alexandria, VA 22313-1450

Name: Louis S. Sorell, Reg. No. 32,439 Date: June 16, 2005

DECLARATION UNDER 37 C.F.R. 1.132

I, DR. JAMEEL AHMAD, hereby declare as follows:

1. I am the inventor of the subject matter of the above-identified patent application.
2. I am currently a full Professor of Civil Engineering and Chairman of the Civil Engineering Department of the Albert Nerken School of Engineering of The Cooper Union for the Advancement of Science and Art. I am also the Director of Research of the Cooper Union Research Foundation. My educational background, employment experience and publications are described in greater detail in my curriculum vitae, a copy of which is annexed hereto as Exhibit A.

3. As part of my duties as a full Professor of Civil Engineering, I teach a graduate-level course entitled "Urban Security (CE/E1D 470)" which includes design of urban systems such as blast walls to protect against blast loads, analysis of blast loads and blast mitigation design considerations. A copy of the course description is annexed hereto as Exhibit B.

4. During March-April, 2005, I taught an 8 week course to personnel of the New York City Police Department's Division of Counterterrorism. I am also currently a consultant to the New York City Police Department on urban security issues.

5. In view of my above-described academic and professional experience, I am well acquainted with the state of the art conventional reinforced concrete systems as well as the state of the art of systems intended to protect against blast loads, such as protective walls, barricades and the like. I have also reviewed U.S. Patent No. 5,248,122 (Graham) and U.S. Patent No. 5,335,472 (Phillips), which have been cited in connection with the prosecution of the above identified patent application.

6. Graham is directed to providing a pre-attached form system for an insulated structural wall panel. More particularly, Graham employs a structural reinforcing grid to which the form is attached, and concrete is placed within the grid spaces. *See* col. 3, lines 5-10. As depicted in Figure 2, vertical member (31) and horizontal member (32) are made up of steel rods (33, 34, 35, 36) and bar ties (37) to form a "rigid, monolithic, reinforcing system . . ." Col. 3, line 61- col. 4, line 12. As depicted in Figure 3, steel rods (35, 36) are embedded in the upper and lower portions of concrete panel (10). However, as shown in Figure 3, the steel rods (35, 36) are not placed throughout concrete panel (10). Accordingly, Graham discloses a conventional "open-loop" reinforcement system, as depicted, for example, in Figure 1 and described in Para. [0019] of my patent application.

7. Phillips is directed to a reinforced concrete prefabricated module for use in the construction of reinforced concrete buildings. As depicted in Figure 5, the module (24) contains an outer metal frame (48), insulation layer (56) and wire mesh layers (58). *See* col. 4, lines 7-15. As shown in Figure 7, a wire mesh layer (53A) may be secured to the outer corner support member (62A). *See* col. 5, lines 9-25. However, the wire mesh layers (58 or 53A) do not extend throughout the entire fill material.

8. In contrast, the invention claimed in my patent application is a "closed-loop" multi-layered, membrane-like system in which the mesh structure loops around continuously without end points or end boundaries, and extends throughout the concrete fill material, as depicted, for example, in Figures 2 and 2A of my patent application. The individual wires have no bending strength; instead, the reinforcing structure of my invention derives its resistance through "membrane" action analogous to the way a "sack of potatoes" is able to hold potatoes even though the walls of the sack have no bending strength. Because each wire mesh cell of the reinforcing structure is continuously connected to other cells, the closed-loop multi-layered membrane structure that is thus formed is capable of developing "hoop" stresses and multi-layered "membrane" action to absorb the explosive energy released by the shock wave of a blast load.

9. In my invention, the mesh structure has a time period of oscillation  $T$  in response to the blast load, the blast load has a time duration of  $t_d$ , and  $T$  is 5-20 times greater than  $t_d$ . Because the oscillation period of the mesh structure is much longer than the duration of the blast load, the mesh structure is able to absorb a large portion of the energy released by the blast load without failing, thereby saving the mesh structure to capture flying aggregate concrete material. Neither Graham nor Philips disclose or suggest such a relationship between  $T$  and  $t_d$ .

10. Upon being hit by the shock wave generated by the blast load, the closed-loop membrane structure of my invention will absorb the energy of the shock wave by stretching like a membrane while containing the concrete fragments for a few milliseconds until the shock wave has passed (shock waves typically have durations in the range of a few milliseconds). The closed-loop, membrane-type reinforcing structure of my invention, acting in a sieve-like manner, will contain the exploding and flying concrete aggregate material resulting from the shock wave of a blast load. The "open-loop" system of Graham cannot contain such concrete fragments, because the steel rods (35, 36), vertical members (31) and horizontal members (32) are only located around the perimeter of concrete panel (10) and are incapable of capturing these fragments and containing them in a sieve-like membrane, as in my invention.

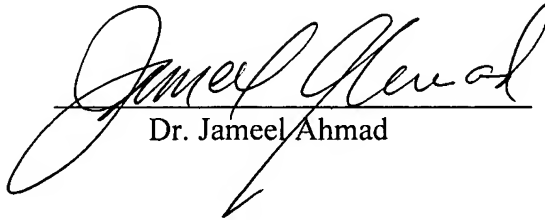
11. One of ordinary skill in the art would not look to the "open-loop" system of Graham to solve the problem addressed by the "closed-loop" structure of the claimed invention: i.e., absorption of the energy associated with the shock wave caused by the blast load, and the containment of the flying concrete aggregate material shattered by the shock wave. The Graham system is designed to be active and responsive to a normal load (i.e., the weight of a building or overlying structure). In contrast, my invention is intended to act as a sacrificial member in response to a blast load; accordingly, my invention is not active or responsive to a normal load. Instead, the closed-loop structure of my invention is only active and responsive to a blast load.

12. In addition, the "open-loop" system of Graham is not configured to translate the blast load into a deflection, because there is no mesh structure within the interior portion of the concrete wall in Graham. As the exploding concrete fragments fly off, the steel rods of Graham will largely remain in place, unbent and unaffected, because there is nothing in the Graham system to prevent the concrete fragments from flying off. The closed-loop wire mesh reinforcement of my invention catches the flying concrete fragments like a sieve, experiencing large deflections like a membrane during the few milliseconds of the duration of the blast.

13. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code, and that such willful false statements may jeopardize the validity of the above-referenced patent application or any patent issuing thereon.

Dated: June 14, 2005

  
Dr. Jameel Ahmad



**Jameel Ahmad**

**Born:** Lahore, Pakistan, May 22, 1941; came to U.S. 1962; naturalized U. S. citizen

**Professor and Chairman, Department of Civil Engineering;** Albert Nerken School of Engineering, The Cooper Union for the Advancement of Science and Art, New York, NY  
**Director of Research,** The Cooper Union Research Foundation, New York, NY

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## **FAMILY**

Son of Nasir and Iftikhar (Dean) Bakhsh; married Rosalba Quiroz, March 31, 1983; children Sidney and Monica

## **EDUCATION**

BS (Civil Engineering), U. Engineering & Technology, Pakistan, 1962  
MS (Civil Engineering), U. Hawaii, 1965  
PhD (Civil Engineering), U. Pennsylvania, 1967

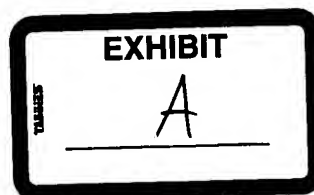
## **CAREER**

Scholar, East-West Center for Technical and Cultural Interchange, U. Hawaii, 1962-65  
Research Fellow, College of Arts and Sciences, U. Pennsylvania, 1965-67  
Assistant Professor, Widener U., Pennsylvania, 1967-68  
Assistant Professor, Cooper Union, N. Y. C., 1968-71; associate professor, 1971-78; professor since 1978; chairman, civil engineering department, since 1990  
Director of Research, The Cooper Union Research Foundation, NYC, since 1983

## **PUBLICATIONS**

Of over 50 professional papers and presentations in engineering, education, technology, innovation and management, selected publications in the areas of blast/dynamic response, biomedical engineering, hydraulic engineering, and asphalt technology are listed below. Relevant publications in the area of urban security and blast effects are shown with an asterisk:

*\*Ahmad, Jameel*, "Post September 11<sup>th</sup> Engineering Challenge: Protecting the Public and Civil Infrastructure Against Terrorism", Clockworks, Albert Nerken School of Engineering, The Cooper Union for the Advancement of Science & Art, Winter 2002-2003.



*\*Ahmad, Jameel*, "Nonlinear Acoustic Response of a Cylindrical Shell", Journal of the Franklin Institute, v 299, n3, March 1975, p 171-189.

*\*Ahmad, Jameel*, "Post-buckling Dynamic Response of Circular Plates", Journal of the Franklin Institute, v 289, n1, January 1970, p 57-64.

*\*Ahmad, Jameel, and Shore, Sidney*, "Post-Buckling Dynamic Response of a Circular Plate", Proceedings of the 10<sup>th</sup> Midwestern Mechanics Conference, Johnson Publishing Co., Fort Collins, CO, USA, 1968.

Haher, Thomas R.; Felmy, William; Baruch, Howard; Devlin, Vincent; Welin, Daniel; O'Brien, Michael; *Ahmad, Jameel*; Valenza, Joseph; Parish, Susan, "The Contribution of the Three Columns of the Spine to Rotational Stability : A Biomechanical Model", Spine, v 14, n 7, July 1989

Haher, Thomas; Tozzi, J.M.; Lospinuso, M.F.; Devlin, V.; O'Brien, Michael; Tenant, R.; *Ahmad, J.*; Valenza, J.; Parrish, S., " The Contribution of the Three Columns of the Spine to Spinal Stability: A Biomechanical Model", Paraplegia 27, 1989, p 432-439.

Cataldo, Joseph; Ronan, Ann Dudek; Thatcher, Llewellyn M; *Ahmad, Jameel*, " Modeling Stratified Flow in Combined Sewer Overflow", Journal of Hydraulic Engineering, v 113, n2, Feb. 1987, p 207-224.

Guido, Vito A.; *Ahmad, Jameel*, "Undergraduate Asphalt Testing Laboratory", ASEE Annual Conference Proceedings, 1998

## **AWARDS**

Abdus Salam Medal for a distinguished career in research (engineering sciences), Pakistan League of America, 1993; Rossi Prize for distinguished research, The Cooper Union for the Advancement of Science & Art, 1971; Gold Medal, U. Engineering & Technology, 1962

## **CONSULTING**

Consultant to private industry, community organizations and local, state and federal governmental agencies (USEPA, NYC, Burns & Roe, Scientific American Publications, High Technologies Inc., PMA Corporation, etc.)

## **COMMUNITY SERVICE**

Member, Board of Directors, Consortium of N.Y.C. Colleges & Universities, Mayor's Office of Construction, 1994-2000

Vice Pres., West Side Community Association, N.Y.C., 1976-77

Vice Pres., Vilmanor Community Association, Forest Hill, NY, since 1992

Advisor, School for the Physical City, New York City Board of Education, 1995-97

Citation for voluntary community service, The Cooper Union, 1991

Director, Pakistan League of America, 1994-98

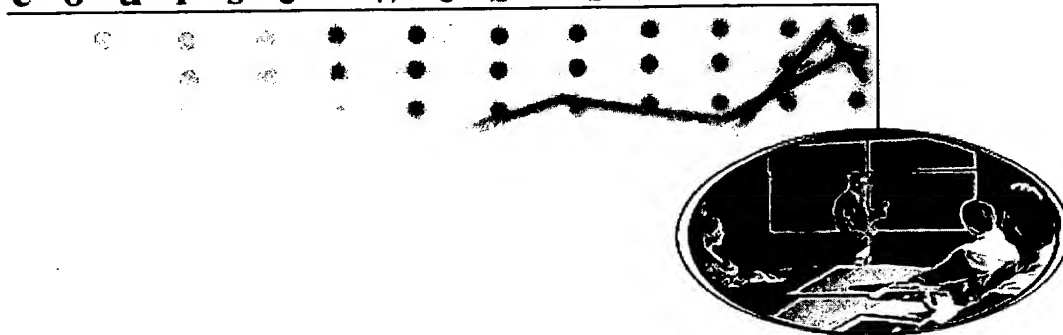
Outstanding Service Award, American Society of Civil Engineers, 1985

Fellow, Research Institute for the Study of Man, since 2001

# The Cooper Union for the Advancement of Science & Art

## EID/CE 470: Urban Security

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EID/CE 470 is new course that was offered for the first time in Fall 2003. The course is part of a new master's program in urban security & protective design that is being piloted under the auspices of Cooper Union's Institute for Urban Security.

### Course Description

Design of urban systems to protect against terrorism. Analysis of blast loads. Blast mitigation design considerations. Technology transfer: military/defense to civilian sector. Response spectra. Pressure-Impulse diagrams. Stand off distances. Blast mitigation measures for buildings, bridges, and tunnels. Prevention of progressive collapse in tall buildings. Design of glazing. Retrofit upgrade of existing urban infrastructure. Proposed changes in New York City Building Code to protect against terrorism. Insurance issues for commercial buildings.

3 credits.

Prerequisite: CE122 or ME101 and permission of instructor.

Jameel Ahmad, Ph.D., Professor & Chairman,  
Department of Civil Engineering & Director, The Cooper  
Union Research Foundation

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